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Patents ADP number *(if you know it)* 7658925001

If the applicant is a corporate body, give the country/state of its incorporation — UNITED KINGDOM

4. Title of the invention — CONTAINER CLOSURE

5. Name of your agent *(if you have one)* — D YOUNG & CO

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CONTAINER CLOSURE

This invention relates to the field of container closures. In one non-limiting aspect, the invention relates to the field of container closures for pressurised products, such as pressurised beverages.

Conventionally, pressurised beverages such as lemonade and beer are contained in bottles which have a screw threaded closure or a crimped metal closure. Generally, the closures are of only a small diameter (typically less than 42 mm). This is because the amount of force exerted on the closure by the pressurised contents will depend on the area of the closure. It is theoretically possible for a larger size of screw-threaded closure to be used, but this would have to be tightened so firmly on the bottle that it would be extremely difficult for a person to unscrew it by hand. Accordingly, there has to be a compromise between the size of the closure, the force which the closure can withstand, and the ability of a person to remove the closure by hand.

Generally, for pressurised beverages, the internal pressure within the bottle can reach pressures of 100 psi. Such high pressures may, for example, be reached during hot pasteurisation of the bottle after filling. During storage at room temperature, the internal pressure is likely to be less than about 40 psi. Nevertheless, the closure has to be able to withstand much higher pressures.

It would be desirable to provide a closure which does not suffer from the above drawbacks, and is better able to be used for wide-mouth containers.

In contrast to the prior art, one aspect of the present invention is to provide a closure having means for engaging the mouth of the container and removable means for bracing the engagement means to hold it in a locked position.

Preferably, the bracing means comprises a band which embraces the engagement means to prevent the engagement means from being displaced radially outwardly.

Preferably, the engagement means comprises one or more lugs which locate or hook under a complementary undercut of the container, to secure the closure in position.

With the above design, the lugs may, for example, locate under a rim, or in a recess, around the mouth of the container, to form a snap fit. The band embracing the lugs prevents the lugs from slipping out of the engagement, even if the cap is subjected to extremely high forces. However, when it is desired to release the closure, it is a relatively simple matter to remove the band. With the band removed, the lugs are free to slide out from the recess as the closure is lifted, or peeled off the container mouth.

Preferably, the band is hingedly attached to the closure. To remove the band from its bracing position, the band is lifted, so that it hinges upwardly. In that condition, the band can then provide a convenient handle to allow the closure to be peeled from the container mouth.

If desired, the closure can be re-fitted to the container by reversing the above process.

Preferably, the band is integrally moulded with the remainder of the closure. More preferably, the band is joined (at least initially) to the engagement means by one or more frangible connections. These connections can provide a tamper-evident feature, and can also ensure that the band is held securely in its bracing position until the closure is removed by the user for the first time.

Preferably, at least one (preferably all) of the frangible connections is in the form of a tapered ridge, which is relatively wide at the point of contact with the engagement means, and tapers towards the point of contact with the band. This can ensure that the fracturing of the frangible connection occurs at a pre-determined point (the narrowest point). The remainder of the bridge then also serves as a spacer to hold the band off the surface of the engagement means, and maintain the band in tension if it is refitted.

Although the engagement means may be in the form of a continuous lug or rim, it is preferred that the engagement means be in the form of lug segments. Such segmenting can enable the lugs to move outwardly independently of each other, and therefore allow the closure to be fitted to, and removed from, the container mouth more easily.

In one form, the closure is configured to allow a predetermined one or more lugs to flex outwardly to vent internal container pressure during initial opening of the

closure, without causing immediate disengagement of other lugs. This can reduce the chances of the closure potentially blowing off the container mouth when the bracing effect is removed.

Preferably, the closure is configured such that the bracing effect is released or relaxed firstly for the predetermined lug or lugs before other lugs, when the bracing means (for example a band) is moved or relaxed.

Preferably, one or more lugs adjacent to the one or more predetermined lugs are configured to interrupt or obstruct any peeling effect caused by flexing of the predetermined lug or lugs. In other words, the lugs are configured such that, when the predetermined lug flexes, this does not result in uncontrolled peeling of the other lugs from around the container mouth.

In one form, this is achieved by providing a space or discontinuity in the engagement means. For example, the lugs adjacent to the predetermined lug may have circumferentially shorter engagement surfaces to provide the discontinuity.

Preferably, a pull-loop or tab is provided on the bracing means to facilitate pulling on the bracing means by a finger, or gripping of the bracing means.

The present invention is especially suitable for use with wide mouth containers. As defined herein, the term "wide mouth" refers to container mouths having a lateral dimension (e.g. diameter) of at least about 40 mm, more preferably at least 45 mm, and more preferably at least 50 mm. The invention can be used for even larger container mouth sizes, for example, at least about 6 cm, at least 7 cm, at least about 7.5 cm, or even larger.

Although the invention is applicable to wide mouth containers, the invention is equally suitable for use on conventional size container mouths, for example of 20mm-45mm in diameter, to replace a conventional screw threaded closure. A problem with conventional screw threaded closures, especially for pressurised contents, is that the plastics closure must be sufficiently rigid to prevent bowing of the upper wall of the closure under internal pressure. Such bowing would tend to tighten and distort the screw threaded engagement, making it virtually impossible to unscrew the closure to remove it. With conventional screw threaded closures, such rigidity is achieved by

using relatively thick plastics walls, which requires a relatively larger amount of plastics material.

In contrast, the present invention does not suffer from the same disadvantages under pressure. In fact, stressing of the closure can improve the seal between the closure and the container mouth. Therefore, the closure can be manufactured with relatively thin plastics walls, requiring significantly less plastics material than the screw threaded closures. Such improved manufacturing economy can provide a closure which may be less expensive to use even for relatively small container mouth sizes.

Embodiments of the invention are now described by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view from above of a wide-mouth container with a closure fitted;

Fig. 2 is a perspective view from below of the closure in isolation;

Fig. 3 is a schematic underside view showing the detail of the closure;

Fig. 4 is a partial section showing fitting of the closure to the container mouth;

Fig. 5 is a partial section showing the engagement of the closure on the container mouth;

Fig. 6 is a perspective view similar to Fig. 2 but showing the band in its released condition;

Fig. 7 is a schematic view of a second embodiment of closure;

Fig. 8 is a schematic section showing possible modification of the closure;

Fig. 9 is a perspective view showing a further embodiment of container and closure;

Fig. 10 is an underside view of the closure of Fig. 9 in isolation;

Fig. 11 is an enlarged view showing a detail of Fig. 9;

Fig. 12 is a section along the line XII-XII of Fig. 11;

Fig. 13 is a schematic section showing a detail of the initial lug and pull-loop;

Fig. 14 is a schematic section showing disengagement of the initial lug when the pull-loop is lifted;

Fig. 15 is a perspective underside view of a further embodiment of closure; and

Fig. 16 is an underside plan view of the closure of Fig. 15.

Referring to Figs. 1 to 6 of the drawings, a glass or plastics container 10 is illustrated for a pressurised beverage. The present embodiment is intended to contain a beer, cider, or carbonated soft drink, and is shaped in the form of a glass. The container 10 has a wide mouth opening 12, which is typically between 60 and 80 mm, preferably about 70mm, in diameter. A fastening rim 11 projects around the mouth opening 12. The rim has a curved upper surface 11a, and a more abrupt undercut surface 11b.

The container is sealed by means of a plastics press-on closure 14. The closure 14 consists of a generally flat upper wall 16 with a rounded rim 18. Depending from the rim 18 are a plurality of segmented lugs 20. In the present embodiment, the closure includes fourteen such lugs 20.

Each lug 20 includes on its inner face a snap fit projection 22 which is dimensioned to engage under the rim 11 around the mouth of the container 10. Each projection 22 has curved lead-in ramp surface 26 shaped to match the profile of the rim surface 11a. Each projection 22 also has a more abrupt abutment surface 28 which forms the engagement with the undercut surface 11b of the rim 11.

The closure 14 also includes an integral band 30 which is attached in this embodiment to one of the lugs by a non-frangible hinge web 32. The band 30 is also integrally attached to each of the other lugs 20 by a plurality of frangible connections 34; in this embodiment, there are about 5 connections per lug 20. As will be described below, the band 30 braces the lugs 20 to prevent the lugs from moving outwardly and thus secure the lugs in a "locked" condition.

As best seen in Figs. 3 and 4, the radially outer surface of each lug is moulded with an arrangement of generally parallel, axially extending ridges 35. The frangible connection 34 is in the form of a thin breakable web extending between a ridge 35 and the band 30.

As is conventional, a non-permeable liner 24 will typically be provided on the inner surface of the closure, to improve the seal, and to act as a barrier layer to prevent the transpiration of the beverage gas through the plastics material of the closure. Such liners are known in the art, particularly when the closure is made from plastics such as

polypropylene. However, in contrast to many conventional screw threaded closures which have to employ low friction liner material (to suit rotation of the closure), the present embodiment is not limited by this constraint because it does not employ a turning action. Therefore, the liner material may, if desired, be a relatively high friction seal material.

Referring to Figs. 3 and 4, to fit the closure 14 to the container 10, a fitting head (not shown) is used. The closure 14 is initially placed on the container mouth rim 11, as shown in Fig. 4. The matching profiles of the rim surface 11a and the projection ramp surface 26 ensure that closure can sit squarely on the rim 11 prior to fitting, so that the closure 14 is not applied skew to the container 10. The fitting head presses downwardly on the closure 14 to force the closure over the rim 11. During the fitting processes, the lugs 20 will be forced outwardly slightly as the snap-fit projections 22 pass over the container rim 11. The band 30 may stretch to some extent to accommodate this outward movement of the lugs 20.

When fitted, the band 30 locks the lugs 20 securely behind the rim 11 of the container mouth, to securely fasten the closure in position. The closure 14 is able to withstand large forces from the internal pressure of the beverage, even during processes such as hot pasteurisation. As best seen in Fig. 4, a seal is established between the closure 14 and the container 10 at the rounded rim section 18 of the closure 14. If the internal pressure within the container increases, this tends to tension the upper wall 16 of the closure, thus increasing the sealing force applied between the closure 14 and the container at the rounded corner region 18.

The abutment surface 28 of each lug 22 and the undercut surface 11b of the rim 11 may have complementary small inclinations, for example, about 10° relative to a plane perpendicular to the container axis. Such an inclination provides two effects:

(a) during fitting of the closure 14 to the container rim 11 (both initially as described above, or when re-applying the closure as described later), the inclined surfaces provide a cam effect to pull the closure 14 downwardly on to the mouth as the lugs spring back to engage behind the rim 11. This provides additional sealing force, and also accommodates a degree of tolerance variation in the precise sizes of the closure 14 and the container mouth;

(b) during removal of the closure 14 (described below), the inclined surfaces permit easy removal of the closure 14 by lifting it.

In order to remove the closure 14, a person has simply to apply finger pressure to lift the band 30, as shown in Fig. 7. Such action causes the frangible connections 34 to tear, but the band 30 remains attached to the remainder of the closure by virtue of the hinge web 32.

With the band 30 lifted out of engagement with the lugs 20, the closure 14 can now be lifted, or peeled, from the container mouth with very little force being required. The lugs are able to slip over the rim 11 around the container mouth, and the small inclination of the abutment surfaces 28 of the lugs facilitates this disengagement. The raised band 30 provides a convenient handle which can be pulled to lift the closure 14 from one edge. It will be appreciated that segmenting of the lugs 20 also aids removal of the closure 14, by allowing the closure to flex, and also allowing the lugs to move outwardly independently of each other.

If desired, the closure 14 can be refitted to the container 10 after use simply by a reverse of the opening steps. With the band in a raised condition, the closure can be snapped into position over the rim 11 of the container mouth. The band 30 can then be lowered into its bracing position around the lugs, to re-lock the lugs in tight engagement with the rim 11.

Although frangible connections might not be provided in all embodiments, the connections do provide the following advantages in the preferred embodiment:

(a) The connections enable simple moulding of the removable band as an integral part of the closure, using a single moulding step;

(b) Prior to opening, the connections act as a tamper evident feature of the closure;

(c) Prior to opening, the connections positively hold the band in position to prevent risk of accidental opening.

Fig. 7 illustrates a slightly modified form of closure 14' in which the generally flat upper wall 16 of the first embodiment is replaced by a slightly dome-shaped wall 38. Such a shape may provide additional strength, and also reduce the stress experienced at the rounded corner region 12 of the closure when the closure is

subjected to very high internal container pressures. However, for some applications, the more "square" shape of the closure of the first embodiment may nevertheless be preferred, for example, for ease of stacking or packaging.

In the above embodiments, the band remains integrally attached to the remainder of the closure once the band is lifted from its bracing position. It will be appreciated that in other embodiments, the band may be completely removable, and might be removed by tearing the band open. The band could, for example, be in the form of a strong filament or plastics film.

Depending on the design of the closure, the use of the segmented lugs 22 might in some cases provide a fail-safe feature for high pressure container contents. With any closure, there is always a danger that if the internal container pressure is too great, the closure might be "blown" off the container mouth. By using segmented lugs, the closure could be designed such that that one or a limited number of the lugs will fail under pressure before the others, leaving a gap through which the high pressure can escape. This can reduce the risk of the closure being blown off completely.

Fig. 8 illustrates other possible modifications of the closure to reduce the risk of the closure blowing off once the band 30 is released. It will be appreciated that one or more of these modifications may be combined, as desired.

As shown in phantom at 22, one or more of the locking projections 22 may be lengthened in a radial direction, so that it provides a greater degree of engagement with the rim of the container mouth.

Additionally, or alternatively, as shown at 20', one or more of the lugs 20 may be lengthened in an axial direction, so that the respective locking projection is spaced axially below the container mouth rim when the closure is in its fully closed position. In this condition, the lug 20' does not contribute to the fastening of the closure on the container mouth. However, as the closure tends to lift (for example, if the closure is tending to be blown off the container mouth once the band 30 has been removed), the tooth of the extended lug 20' provides a second-stage of engagement to obstruct free removal of the closure.

A further possibility is that, as indicated at 35', the ridges on the surface of each lug could be extended to provide additional stiffening of the lug. The stiffer lugs

would then provide a more secure engagement with the container mouth once the band 30 had been removed.

Figs. 9-14 show a further embodiment of closure, designed to be easy to open, yet also to vent safely internal pressure from within the container. This embodiment is similar to the first embodiment described above, and the same reference numerals are used where appropriate to denote equivalent features.

Referring to Figs. 9 and 10, the band 30 is formed with an integral finger-loop or pull-loop 40 at a position diametrically opposite the hinge web 32 (or at a position opposite the effective "centre" if more than one hinge web is used). The pull-loop 40 is dimensioned to enable a person's finger to be passed through the loop 40, or to enable it to be gripped easily by a finger and thumb. The loop 40 serves three functions:

(a) it provides an easy way of gripping the band 30 to lift the band;

(b) it ensures that the band 30 will always be lifted by a force applied at a predetermined location diametrically opposite the hinge web 32; and

(c) as a safety feature, if the user passes his finger through the loop 40, it can ensure that the closure will not blow freely off the container mouth if the internal pressure has risen above anticipated levels which the closure is designed to accommodate.

The lugs 20a and 20b in the vicinity of the pull-loop 40 are modified compared to the profile of the first embodiment, to provide control over the manner in which the lugs are released when the band 30 is lifted. As best seen in Figs. 10 and 11, the lug 20a diametrically opposite the hinge web 32 (i.e. and in register with the pull-loop 40) is referred to as the "initial" lug, and is modified to ensure that it will be released from engagement by the band 30 before any of the other lugs 20. To achieve this, the ridges 35a are shortened in an axial direction, such that they do not extend significantly above the level of the band 30. Therefore, when the band 30 begins to lift (when the closure is opened), it will release the bracing effect on the ridges 35a of the initial lug 20a before releasing the bracing effect on any other lugs. Therefore, the internal pressure within the container will be able to vent around the released initial lug 20a.

The lugs 20b immediately either side of the initial lug 20a are modified to have circumferentially shorter snap-fit projections 22b which are spaced away from the lug 20a. Generally, the projections 22b will be between 25% and 90% of the circumferential dimension of the lug 20b, typically between 50% and 75%, for example about 66%. The shortened projections 22b have three effects:

(a) Firstly, the short projections 22b tend to interrupt or reduce the peeling effect when the initial lug 20a is disengaged from the container rim. This can allow the initial lug 20a to be lifted significantly without "peeling" the adjacent lugs 20b.

(b) Secondly, the shortening of the projections 22b leaves a region around the initial lug 20a in which there is no interlocking engagement with the container rim 11. This has the effect of increasing the loading force on the initial lug 20a relative to the other regularly spaced lugs, to further ensure that the initial lug 20a will disengage first from the rim 11.

(c) Thirdly, the region of non-interlocking engagement around the initial lug 20a provides room for the closure to distort, to provide a vent path around the initial lug 20a. It will be appreciated that, were the lugs 20b to interlock with the container rim 11 at positions too close to the initial lug 20a, then this might have the undesirable effect of clamping the closure tightly against the rim 11 in the region of the initial lug 20a, and hence obstruct any venting.

The manner in which the initial lug is disengaged is illustrated in Figs. 13 and 14. In Fig. 13, the pull-loop 40 is shown in its normal un-opened position in which it lies flat against, or close to, the initial lug 20a. Referring to Fig. 14, when the pull-loop 40 is lifted (to release the band 30), the initial effect is for the band 30 to move above the short ridges 35a of the initial lug 20a (although the band 30 will remain bracing the ridges of the other lugs). Prior to the frangible connections 34 beginning to break, the lifting of the pull-loop 40 also twists the initial lug 20a outwardly, to release the engagement of the snap-fit projection 22a carried by the initial lug, and allow the container pressure to be vented. The internal pressure can distort the closure in the region 42 when the lug 20a is disengaged, to provide the vent path between the closure and the container rim 11. Further upward movement (not shown) of the pull-loop 40 causes the frangible connections 34 to begin to break. However, the circumferential

shortening of the snap-fit projections 22b for the lugs 20b, and the axial shortening of the ridges 35a for the initial lug 20a, together combine to allow the initial lug 20a to flex outwardly without commencing peeling of the adjacent lugs 20b and the remaining lugs 20.

Finally, once the band 30 has been lifted fully, the closure can be peeled from the container mouth by using the band as a handle as in the first embodiment. Therefore, the closure is peeled from a position adjacent to the hinge web 32.

The size of the snap-fit projections 22b on the lugs 20b on either side of the initial lug 20a can be varied as desired to ensure, in practice, that flexing of the initial lug 20a to vent internal pressure does not cause the adjacent lugs 20b to begin peeling from the container mouth. In one possible modification, illustrated in Figs. 15 and 16, the projection may be omitted altogether from the lugs 20b, leaving instead a generally smooth non-interlocking surface. This would provide an optimum discontinuity interruption of any peeling effect from the initial lug 20a. However, complete removal of the snap-fit projection from the lugs 20b might weaken the overall engagement between the closure and the container mouth, and reduce the maximum pressure which the closure is able to withstand prior to opening.

In Figs. 15 and 16, the closure 14 employs two hinge webs 32a and 32b instead of a single hinge web 32. The pull-loop 40 is positioned to be diametrically opposite the effective centre of the hinge webs, i.e. opposite the most central lug between the two hinge webs 32a and 32b. It will be appreciated that two or more hinge webs may be used in any of the preceding embodiments as desired.

If desired, the pull-loop 40 may be omitted from the embodiments illustrated in Figs. 9-16. The closure would still operate in a similar manner to that described above, but would rely on manually lifting the band 30, for example by thumb.

If desired, the further modifications illustrated in Fig. 8 may be incorporated into one or more of the lugs of the embodiments of Figs. 9-16 to further modify the characteristics of the closure.

It will be appreciated that the invention, particularly as illustrated in the preferred embodiments, can provide a closure which can withstand large forces, yet is also easy to remove when desired. The closure is also easy to produce, and easy to fit

to container mouths. Although the invention is not limited to wide mouth containers, this is an application for which the closure is especially suitable. Similarly, although the invention is not limited only to pressurised containers, this is an application for which the invention is especially suitable.

It will be appreciated that the foregoing description is merely illustrative of a preferred form of the invention, and that many modifications may be made within the scope of the invention.

Features believed to be of importance are defined in the appended claims. However, the Applicant claims protection for any novel feature or idea described herein and/or illustrated in the drawings whether or not emphasis has been placed thereon.

CLAIMS

1. A container closure assembly, comprising a container mouth and a closure therefor, the closure comprising means for engaging the mouth and removable means for bracing the engagement means to hold it in a locked condition.

2. An assembly according to claim 1, wherein the bracing means comprises a band which at least in one operative position of the band embraces the engagement means, to resist outward movement of the engagement means.

3. An assembly according to claim 1 or 2, wherein the engagement means is segmented.

4. An assembly according to claim 1, 2 or 3, wherein the engagement means comprises one or more lugs which engage one or more undercuts adjacent to the container mouth.

5. An assembly according to claim 4, wherein the undercut comprises a rim around the container mouth.

6. An assembly according to claim 4 or 5, wherein at least one said lug comprises a locking projection, the locking projection comprising a lead-in ramp, surface, and an abutment surface.

7. An assembly according to claim 6, wherein the abutment surface is inclined at an angle whose magnitude is less than that of the inclination of the ramp surface.

8. An assembly according to claim 2 or any claim dependent thereon, wherein the hand is hingedly movable.

9. An assembly according to claim 2 or any claim dependent thereon, wherein the hand is integrally formed with the remainder of the closure.

10. An assembly according to claim 2 or any claim dependent thereon, comprising at least one frangible connection between the band and an adjacent portion of the closure.

11. An assembly according to any preceding claim wherein the container mouth is a wide mouth (as defined herein).

12. An assembly according to any preceding claim, wherein the closure is of plastics.

13. An assembly according to any preceding claim, wherein the closure is refittable to the container mouth after it has been removed for the first time.

14. A container comprising an assembly as defined in any preceding claim.

15. A press-fit, lift-off container closure comprising an upper wall, a side wall or wall segment depending from the upper wall, engagement means on a radially minor face of the side wall or wall segment, and removable bracing means for bracing the side wall or wall segment to restrain radially outward movement thereof.

16. A closure according to claim 15, wherein the bracing means comprises a band.

17. A closure according to claim 15 or 16, wherein the bracing means is hingedly movable.

18. A closure according to claim 15, 16 or 17 comprising a plurality of depending side wall segments.

19. A method of fitting a closure to a container mouth, the method comprising:

providing a press-fit closure comprising engagement means for engaging the container mouth, and bracing means for bracing the engagement means to resist outward movement of the engagement means; and

pressing the closure on to the container mouth while the bracing means in its operative position to resist outward movement of the engagement means.

20. A method according to claim 19, wherein the container mouth comprises a projecting rim, and the step of pressing comprises pressing the closure such that the engagement means interlocks with the rim.

21. A method of production comprising a method as defined in claim 19 or 20.

22. A container, a container closure assembly, a closure or a method, being substantially as hereinbefore described with reference to any of the accompanying drawings.

ABSTRACT

CONTAINER CLOSURE (FIG. 9)

A press-fit container closure (14) includes a plurality of depending segmented lugs (20) with snap-fit projections for engaging behind the rim of a container mouth. An integral band (30) embraces the lugs to lock the closure (14) securely on the container mouth. To remove the closure (14), the band (30) is lifted away (e.g. pivoted upwards). The lugs (20) are then free to flex outwardly, allowing the closure (14) to be lifted off the container mouth. The band (30) may be secured to the lugs (20) by frangible connections (34) to provide a tamper evident feature. One or more predetermined lugs (20a) may be designed to be released prior to other lugs during opening, to vent internal pressure from within the container while the remaining lugs hold the closure securely and prevent the closure from blowing off the container mouth.

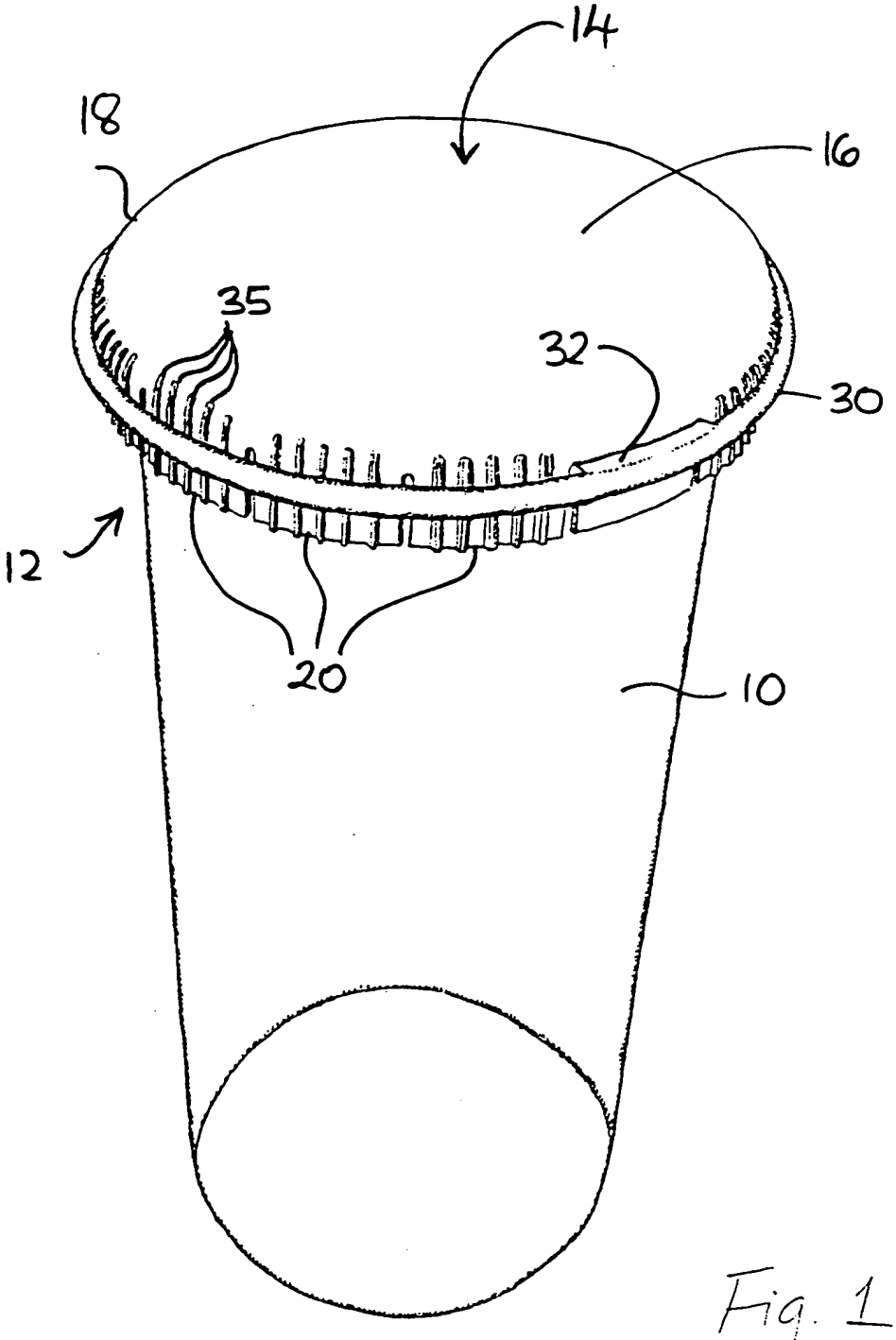


Fig. 1

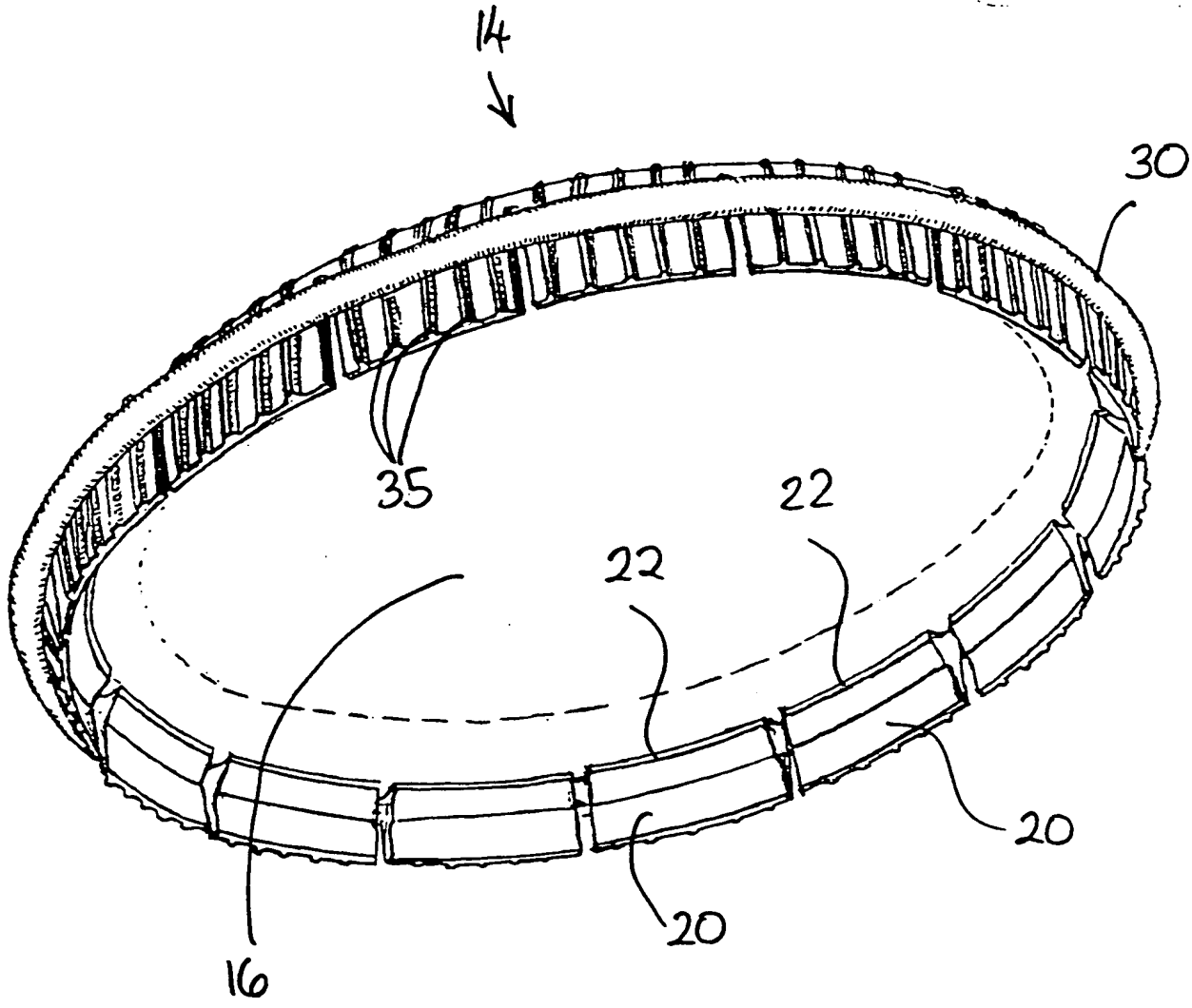
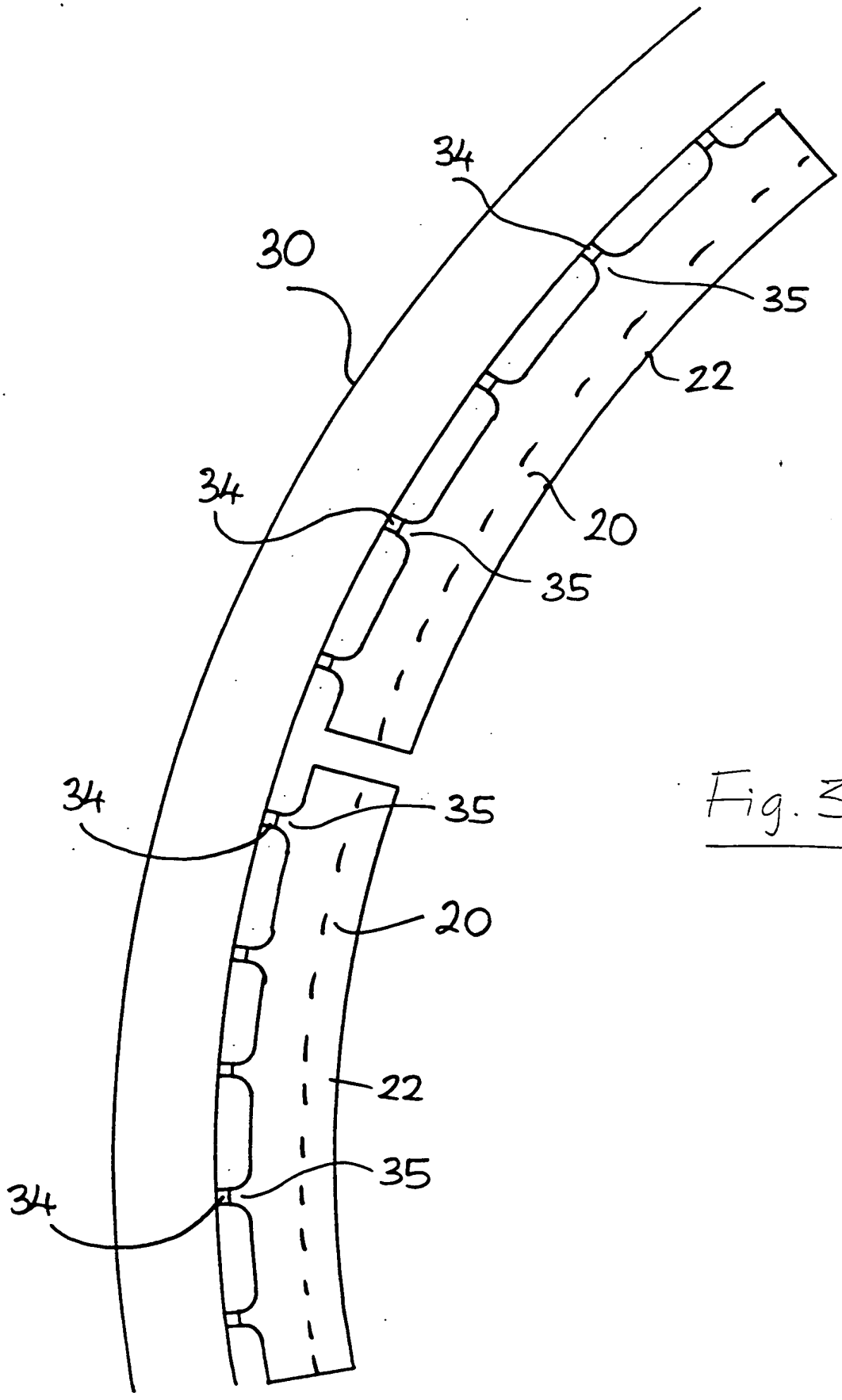


Fig 2



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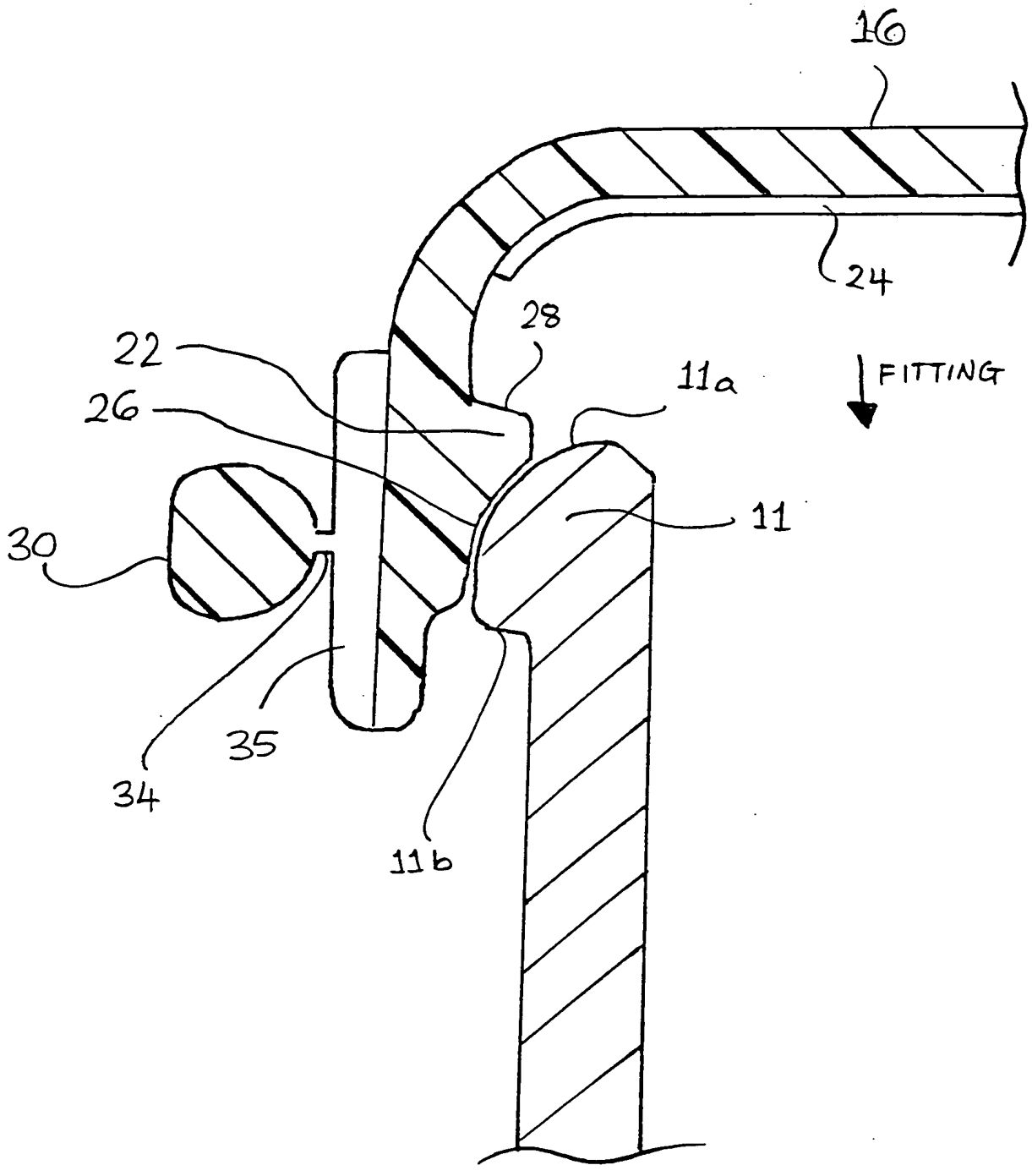

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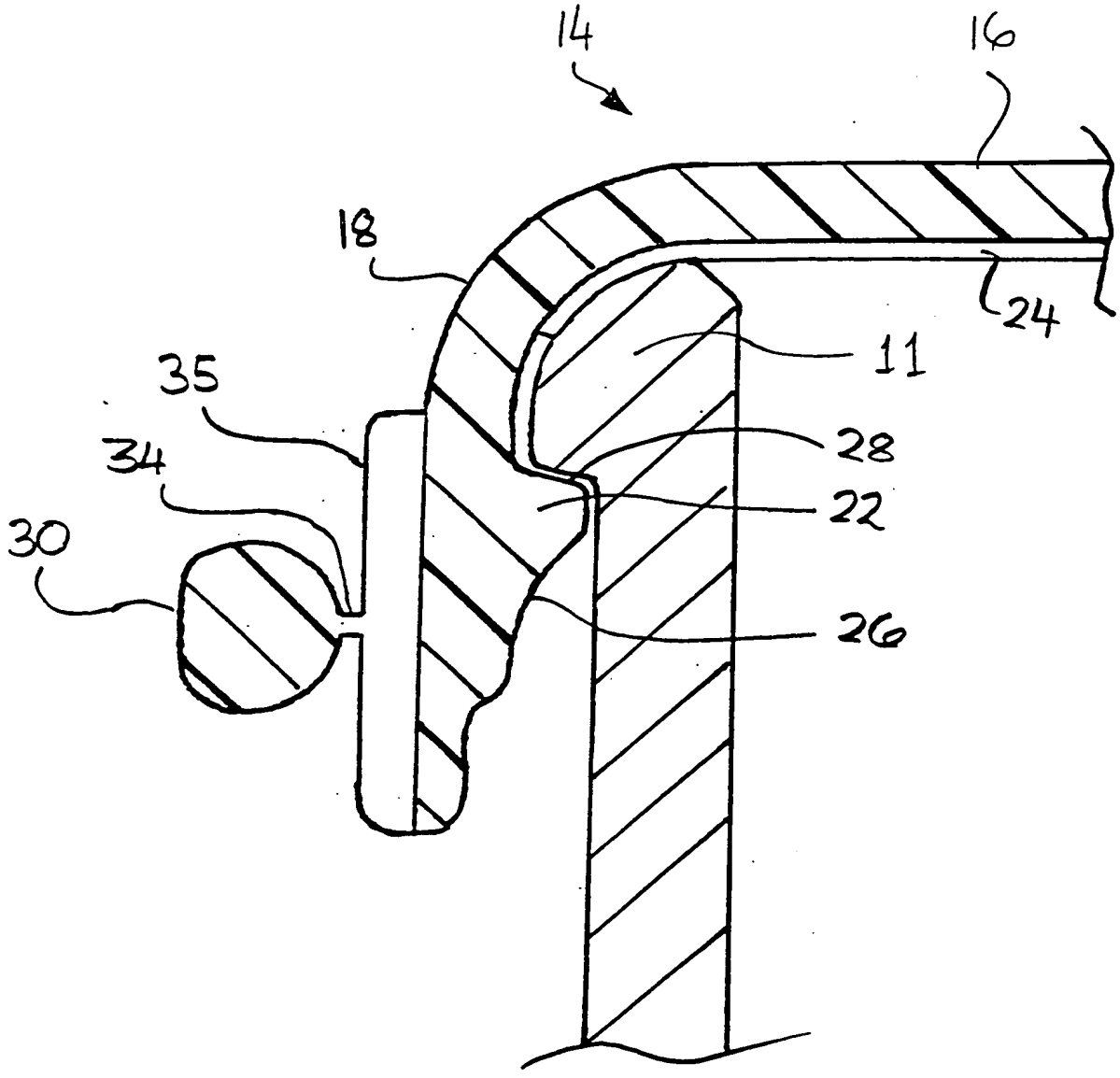


Fig. 5

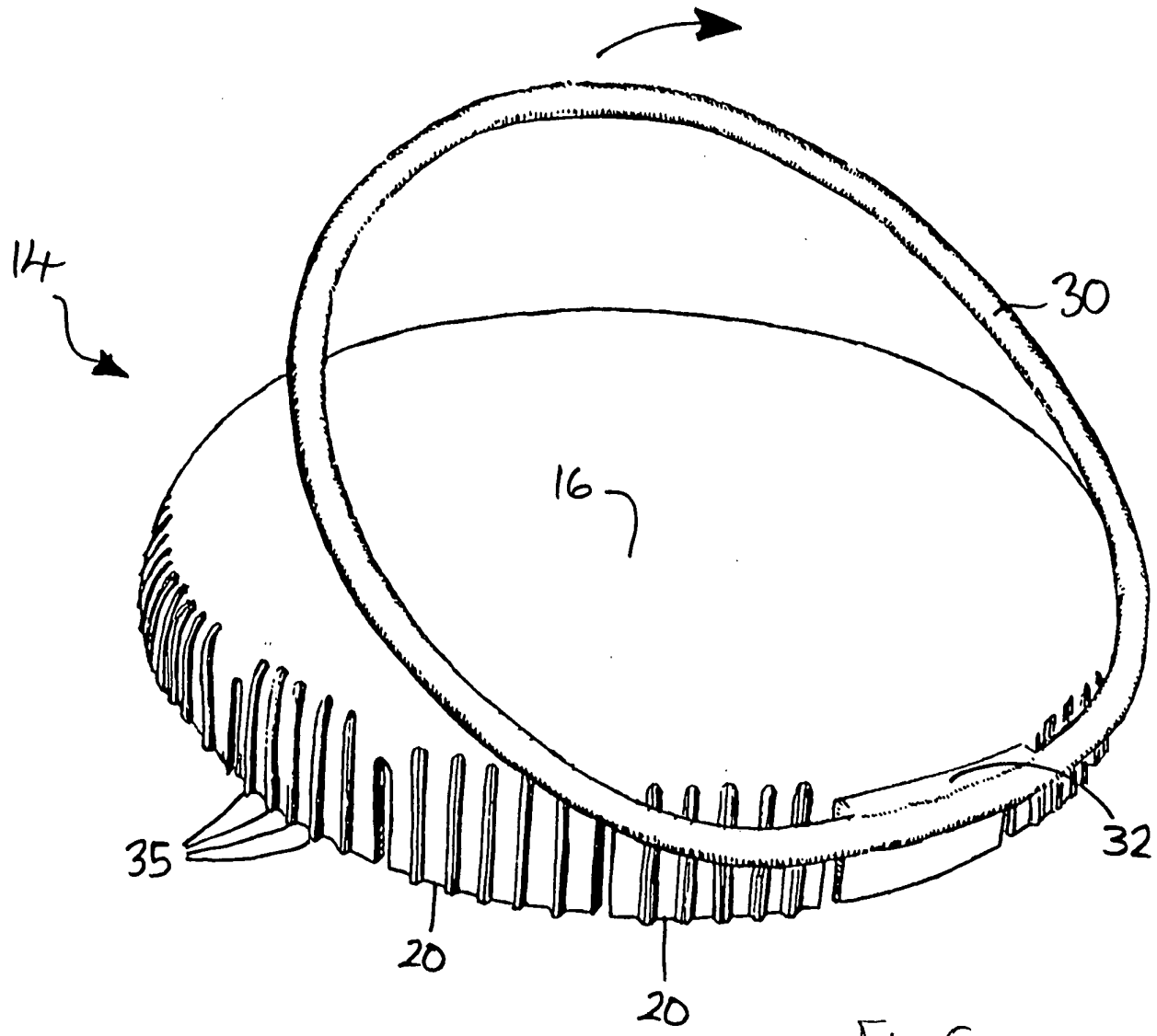


Fig. 6

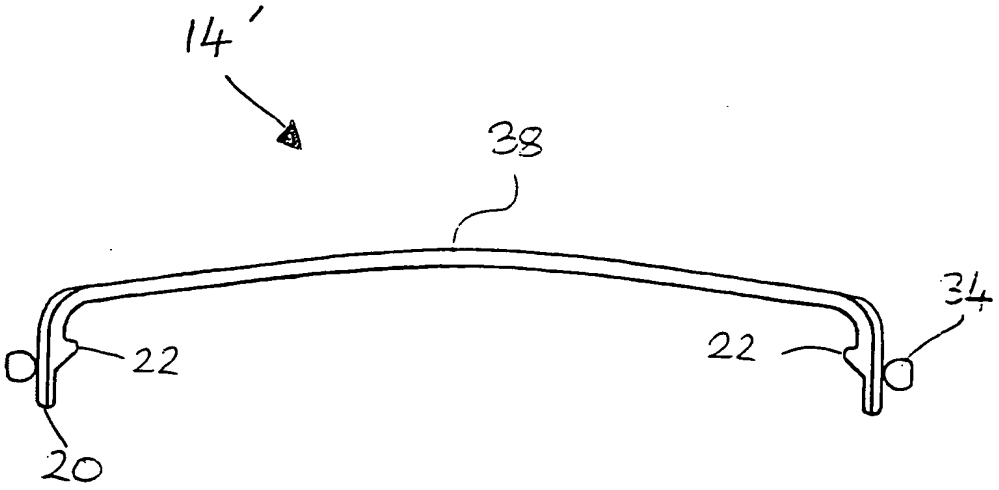


Fig. 7

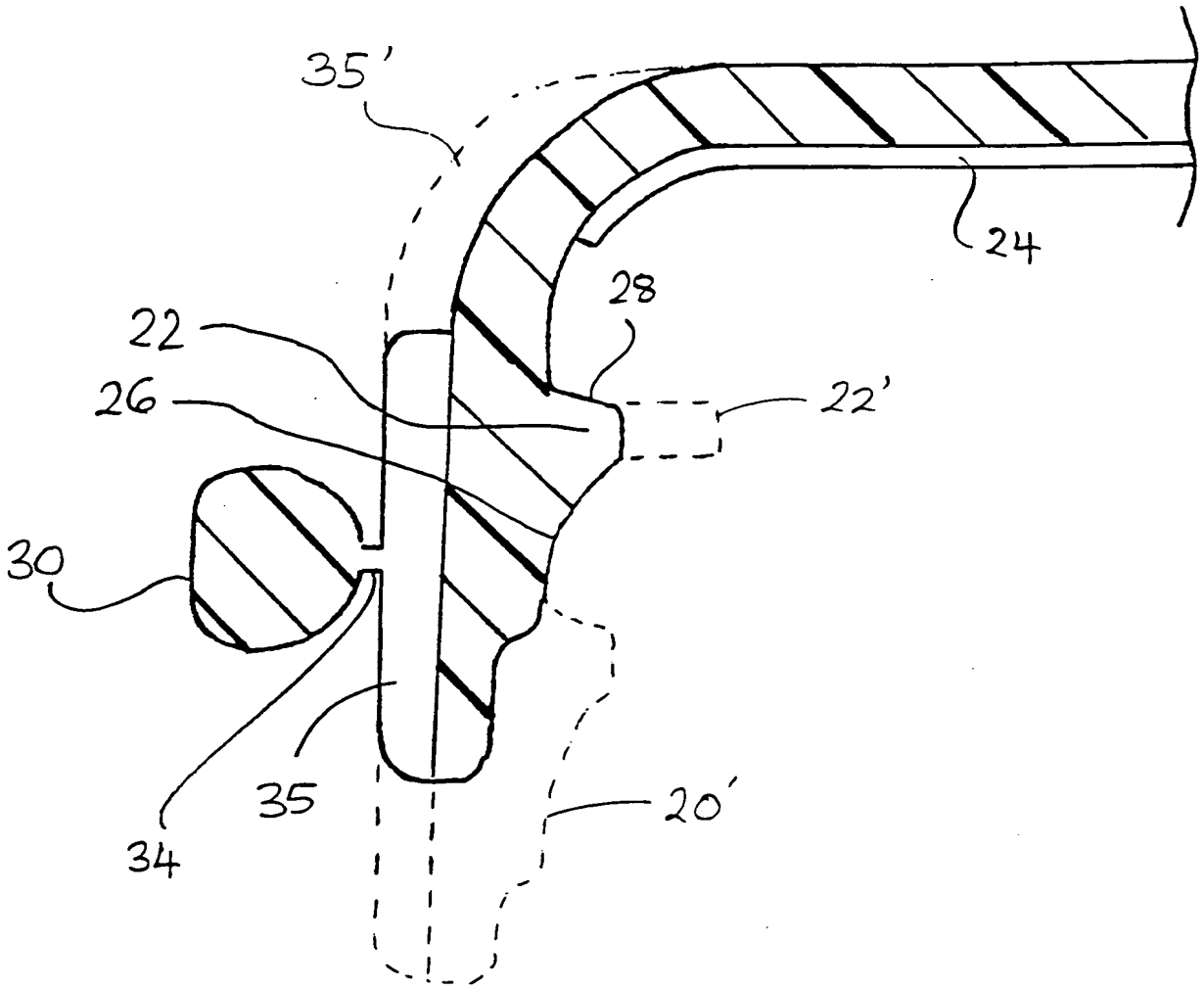


Fig. 8

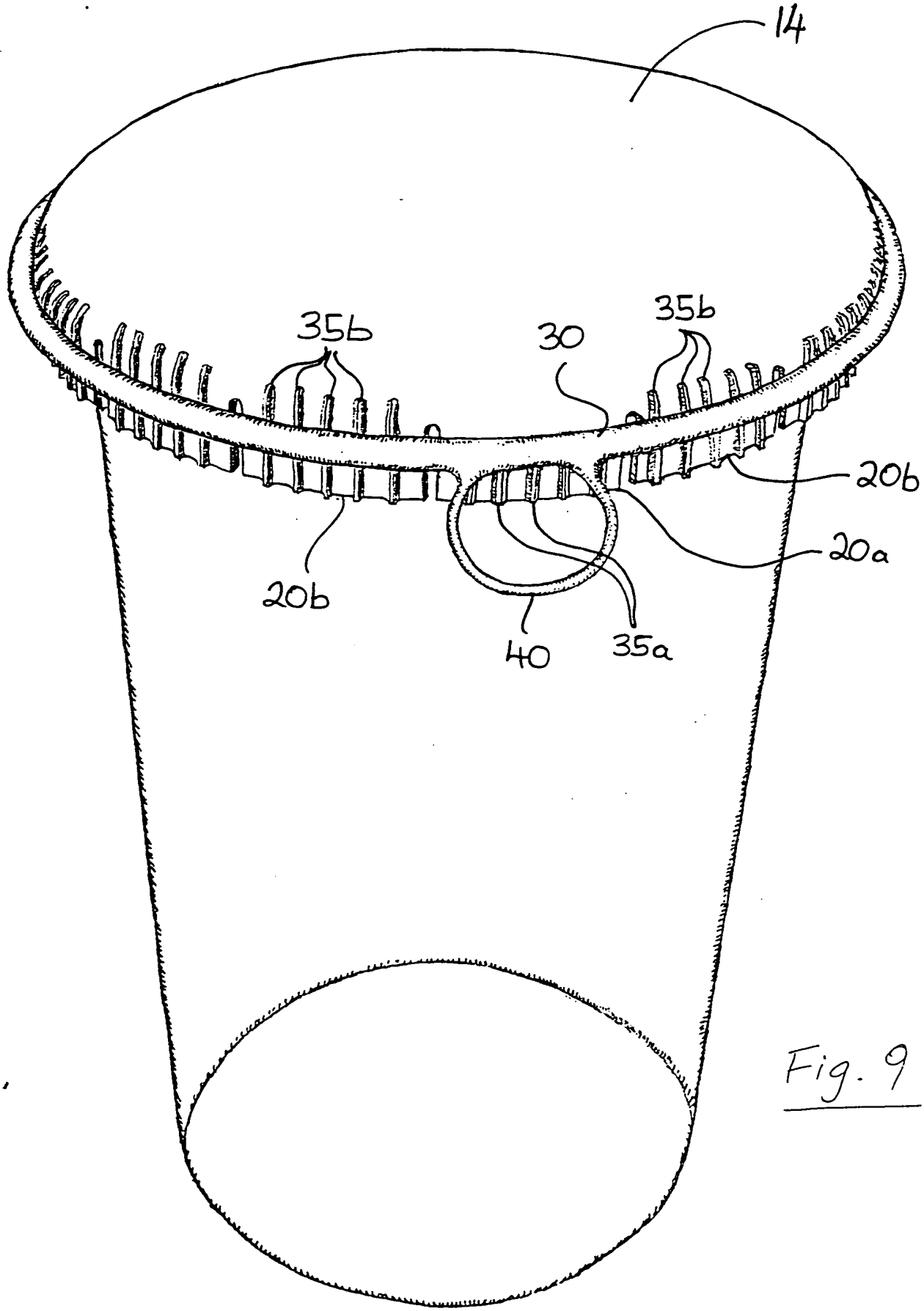


Fig. 9

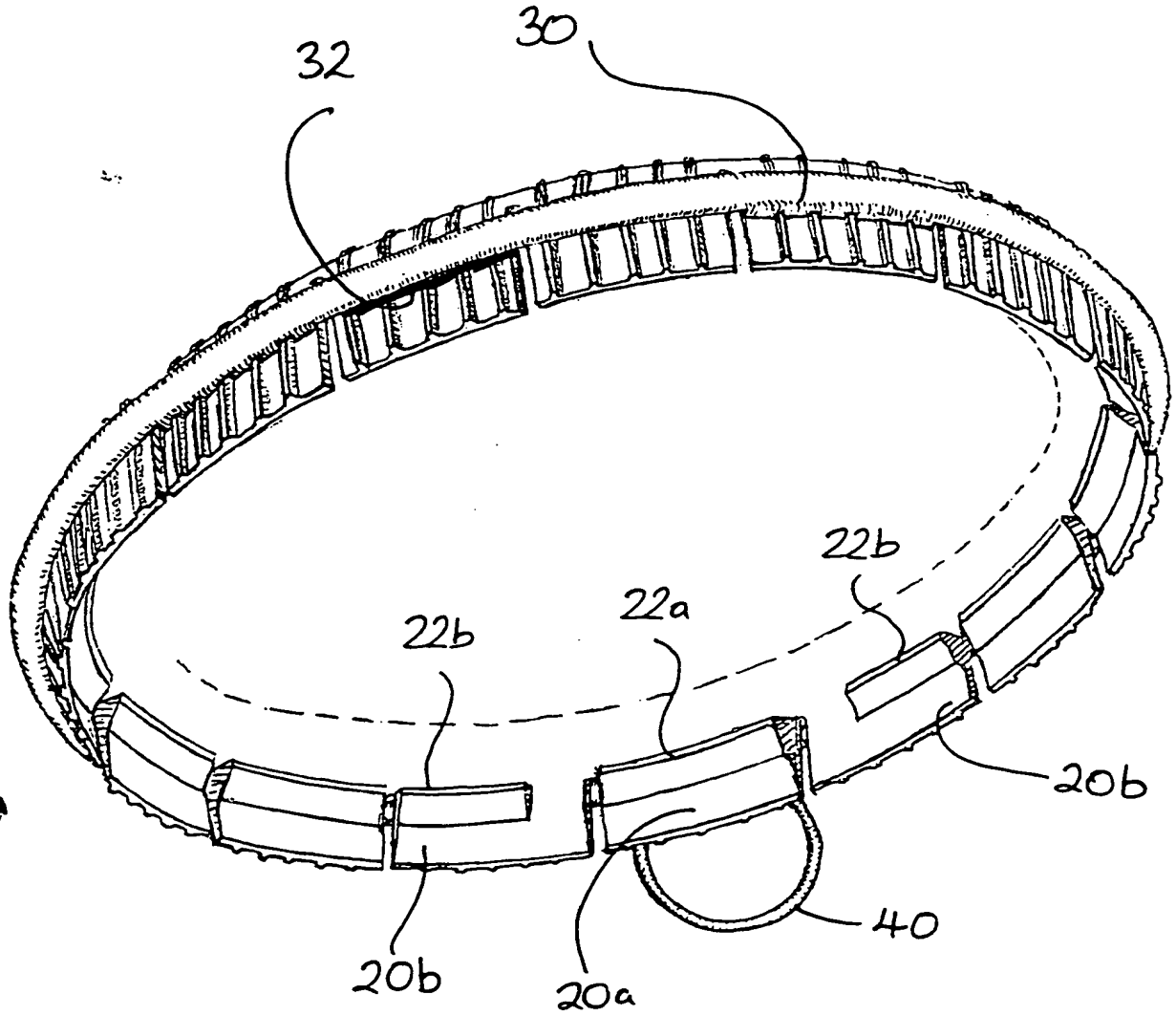
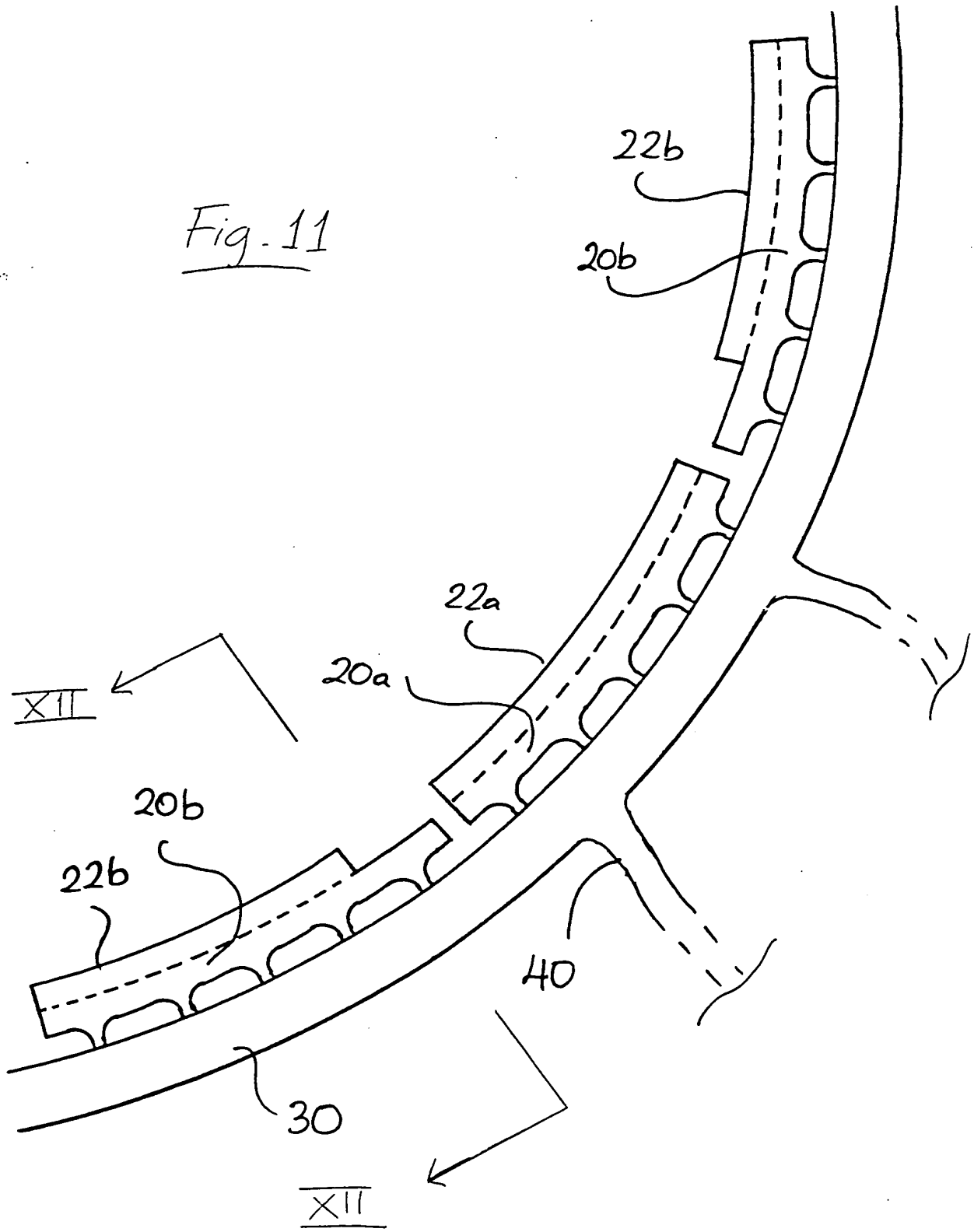


Fig. 10

Fig. 11



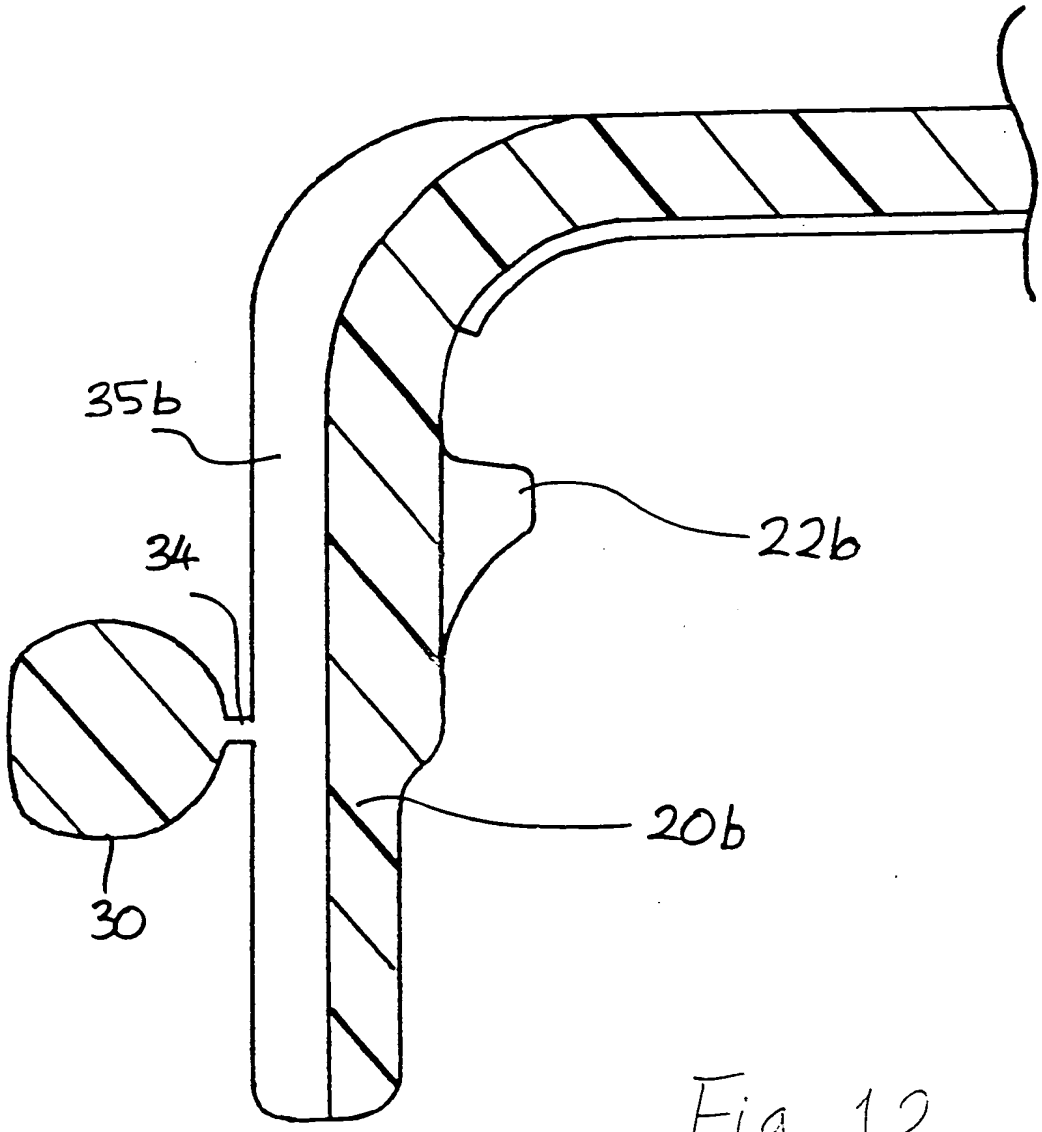


Fig. 12

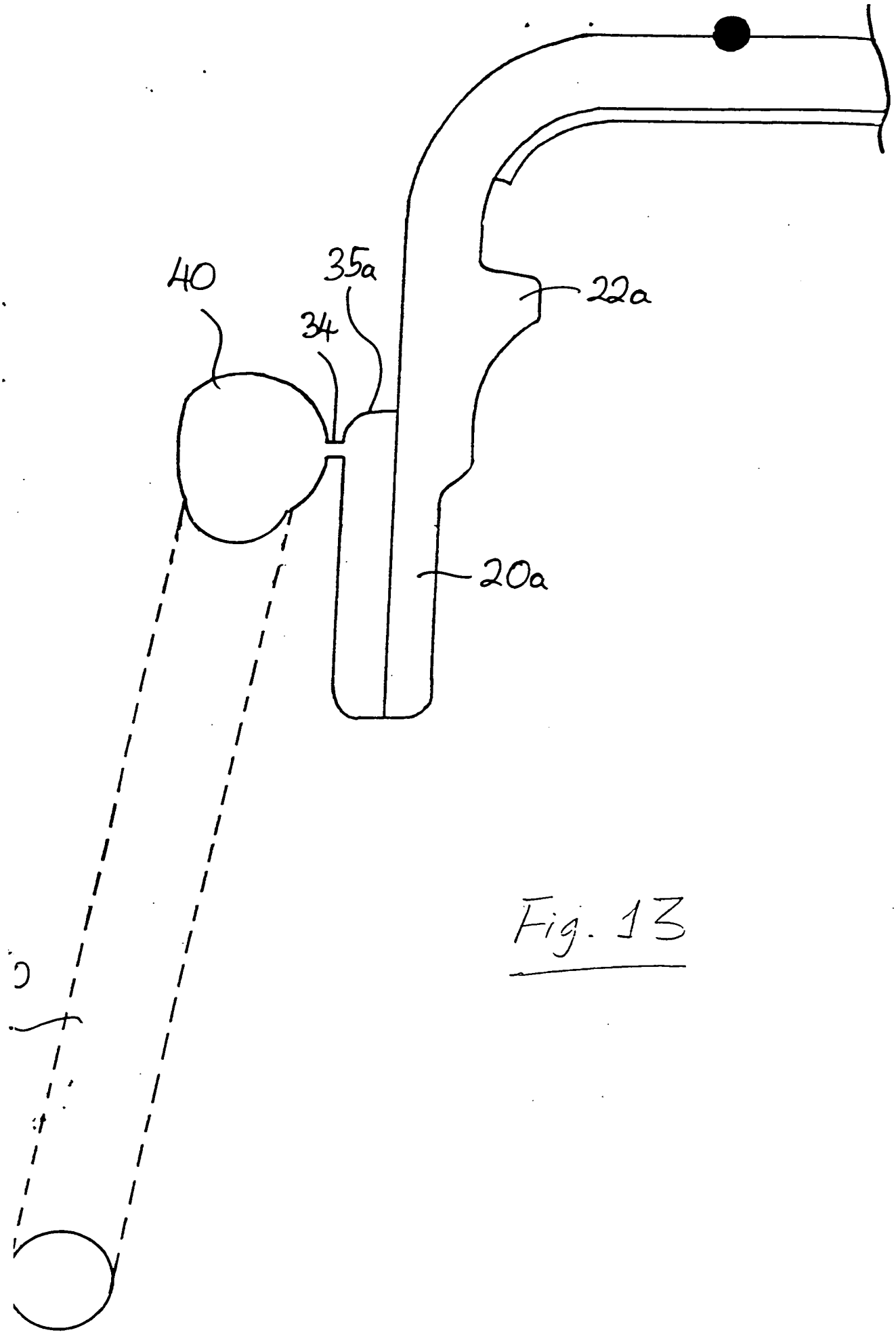


Fig. 13

Fig. 14

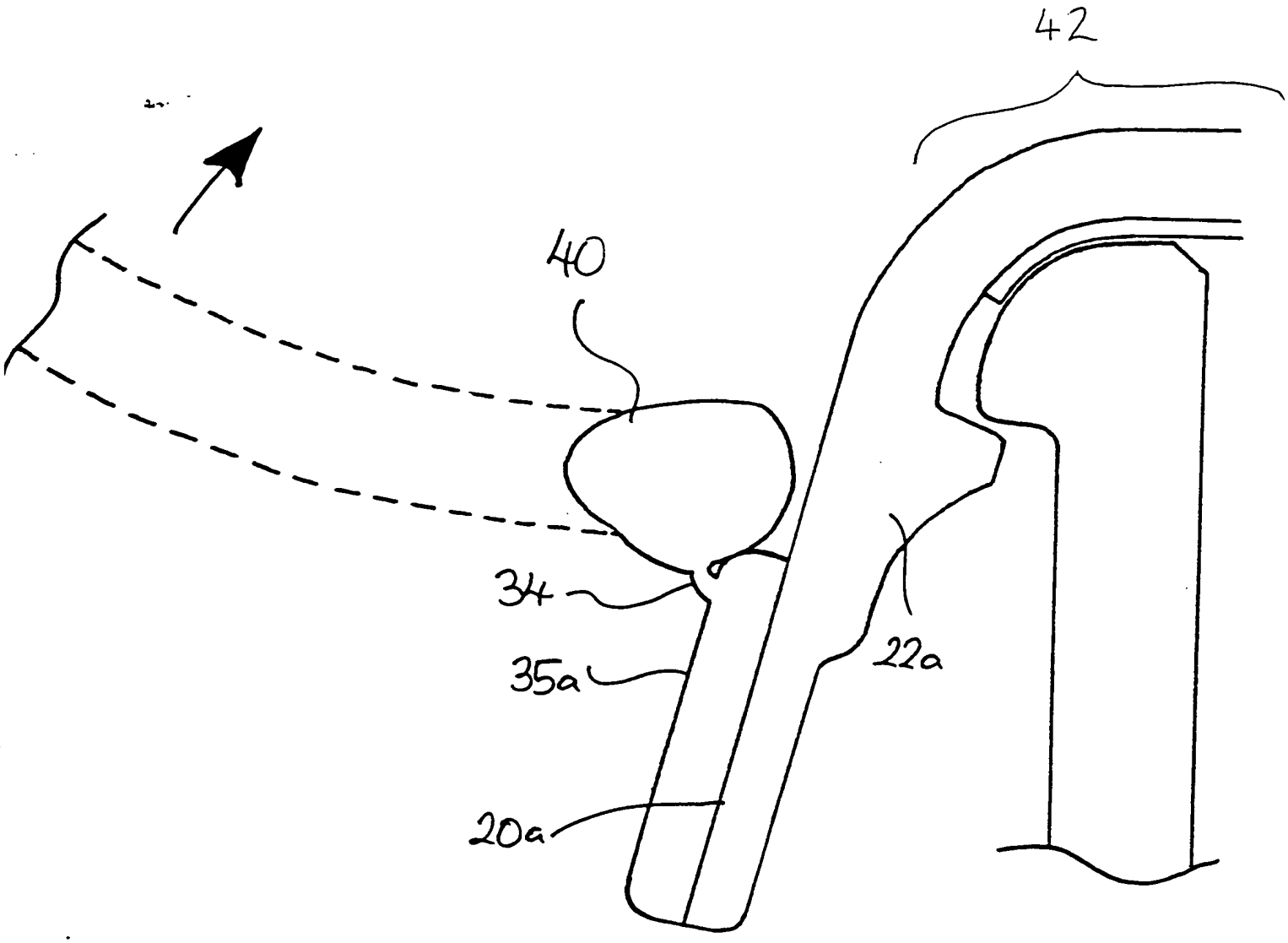


Fig. 15

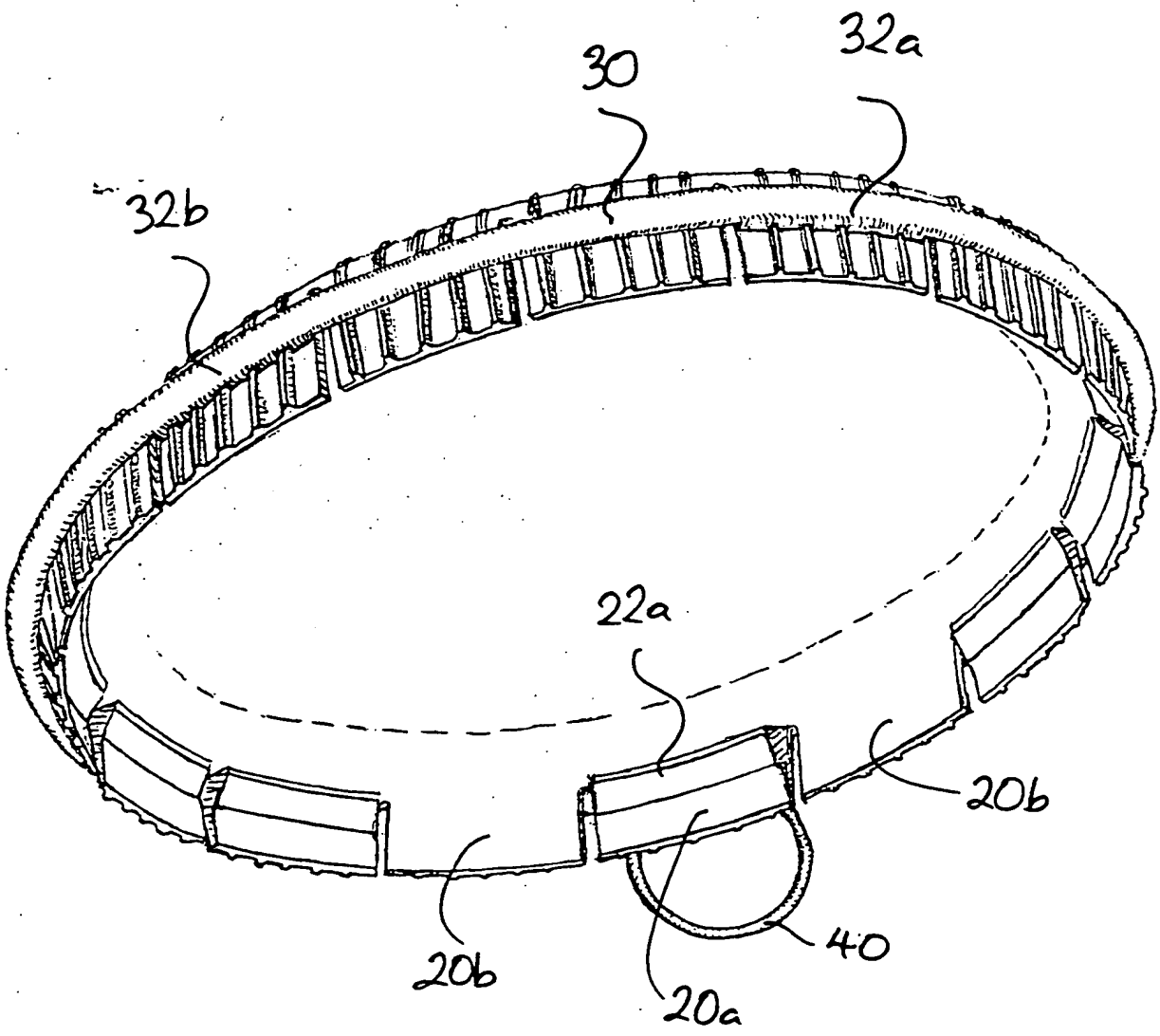
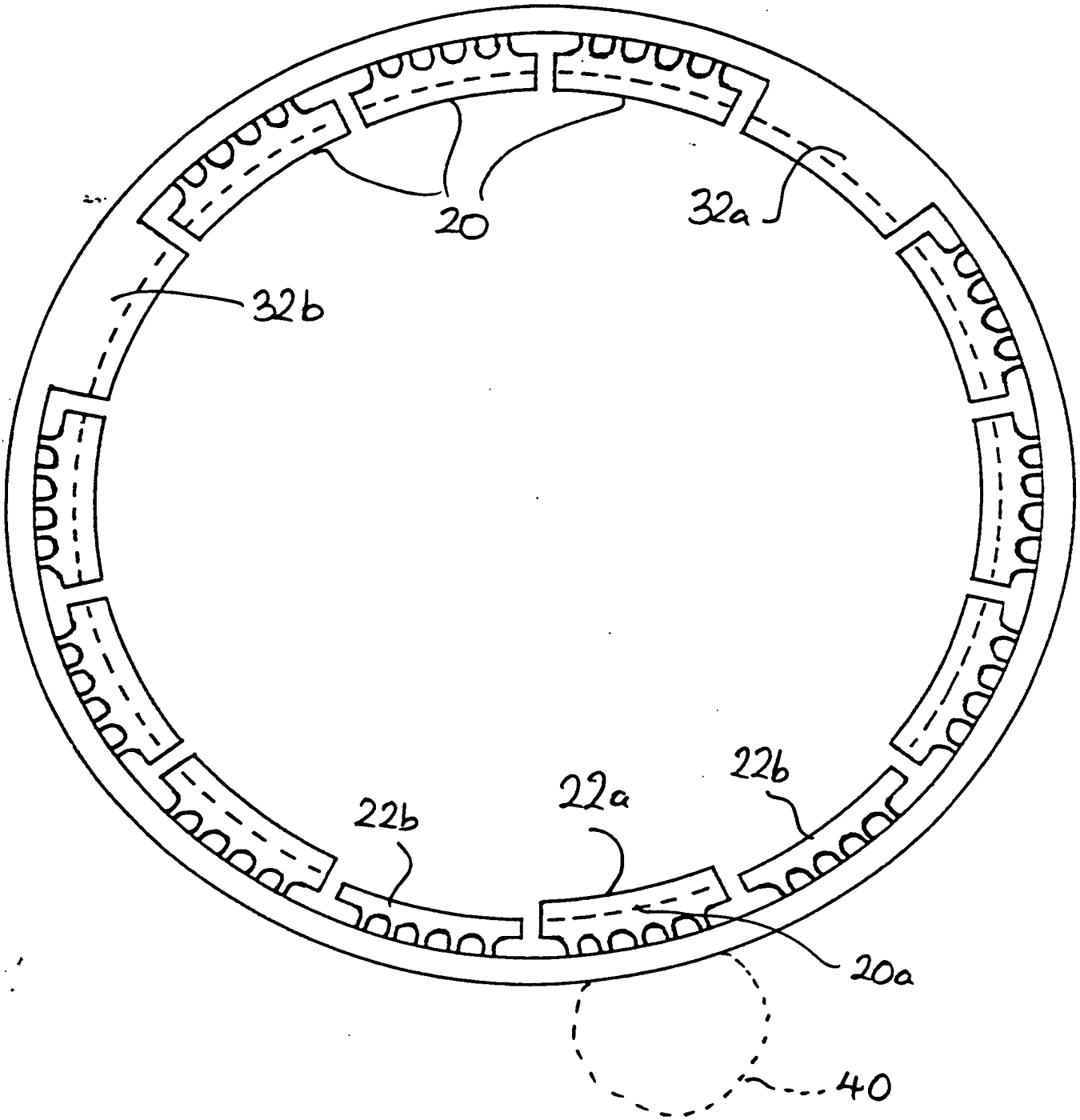


Fig. 1G



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